AVIATION

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VOLUME XIV

Number 11

SPECIAL FEATURES

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SEAPLANES—PRESENT STATUS OF THE QUESTION

AN OPTICAL ALTITUDE INDICATOR FOR NIGHT LANDING

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

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MARCH 12, 1923

AVIATION

VOL. XIV. NO. 11

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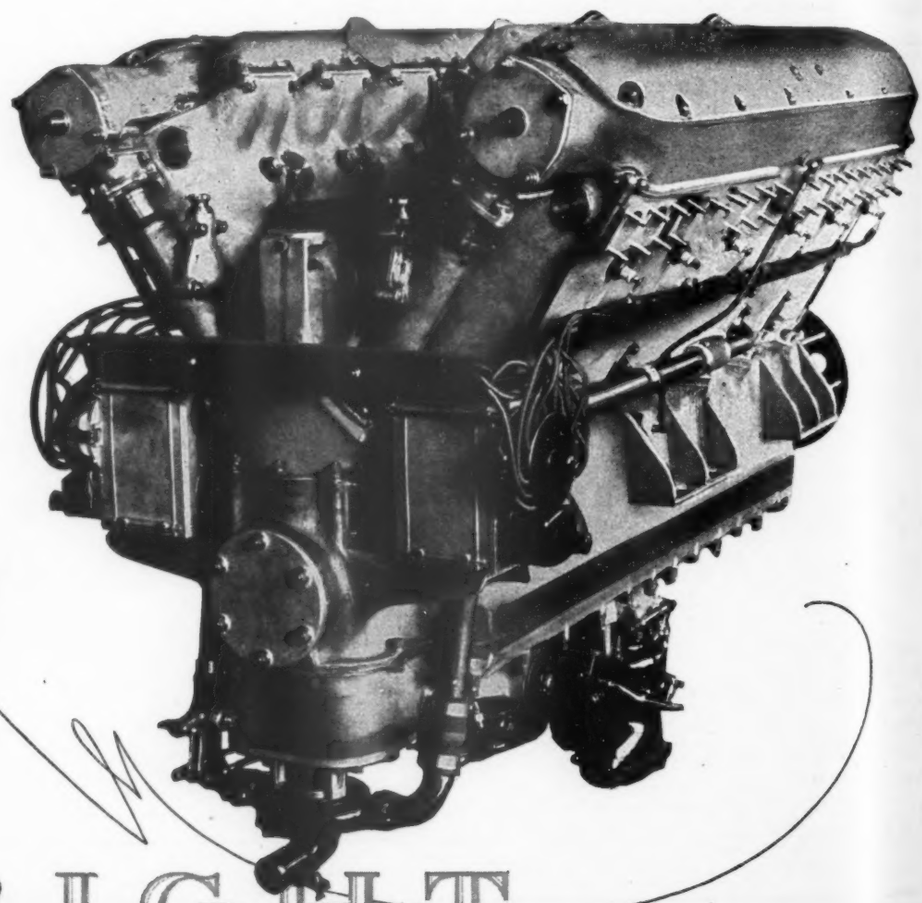

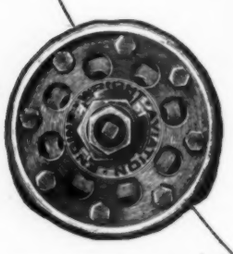

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Vol. XIV MARCH 12, 1923 No. 11

Defenseless in the Air

IF war were declared tomorrow, what would we do for aircraft? This question is not being asked by the aircraft industry but by the War Department. It is not easy to make a satisfactory reply to this question which involves one of the most important problems of national defense.

There are now three possible methods of attack from enemy countries: by air, by sea and by land. Under modern conditions of warfare an attack by air is so much more probable than any other kind that it has been considered as the first stage of hostilities by practically every country. As the main manufacturing plants of the country are within easy bombing range of our borders, our defenseless condition against air raids becomes apparent.

In case war were declared within the next year, neither the Navy nor the Army with their present equipment could meet a modern enemy air force with the hope of defeating it. Blue prints and experimental aircraft would only constitute a potential force that could become effective in six months or in a year, and only if the producing plants remained intact. The public is averse to the discussion of the possibility of war menace because it feels that the United States is so fortunately situated and so wealthy that no country would ever attack our mainland. This is probably true.

But we have the Panama Canal, we have Hawaii, the Philippines and Alaska beside important interests in all parts of the world. Heretofore our Navy could be relied upon to uphold our State Department in all questions affecting American rights and honor. It is probable that an enemy would choose its place for a conflict and that would be where its aircraft could operate with the greatest efficiency against our naval and military forces—granting that our air forces are undeveloped as they are at present.

Without air forces no navy can operate successfully, and troops cannot be transported in the face of aerial opposition. Confronted by this situation, the American foreign policy will have to be modified to meet our impotent position in the air. Heretofore a naval or military demonstration would have prompt effect; but without an effective air force our former strength would only be an exposure of weakness.

The answer to the question of the War Department is an adequate standing air force, proportionate in potentiality to our Army and Navy. This does not mean an *air service,* corresponding to 5 per cent of the military and naval appropriations. It means that here is a place where a dollar spent for preparation will save thousands which would have to be spent in an emergency.

That the equipment of a standing air force would be up to the latest requirements in engineering development is not possible in the air any more than it is on the sea. Aircraft, like seacraft, start to be obsolete the day they are commissioned. But an air force of pursuit, bombardment and attack ready to operate at the start of hostilities is essential even if some of the ships are a year or two behind the latest experimental types. A navy cannot be built after war is declared, and likewise an air force cannot be trained and organized in time to be effective unless there is at least a force always in readiness to act as our first line of defense.

A Far-Seeing Plan

THE new project of the British air ministry whereby all British airways would be operated by a single corporation, adequately financed and being assured of continuing contracts for the duration of ten years, is perhaps the most striking illustration of the importance commercial aviation has assumed since the war.

The plan of the British government to cooperate to the extent of about $5,000,000 with a privately managed air transport corporation resembles broadly a scheme discussed in France with a view to unifying the presently dispersed efforts of half a dozen airway companies. In France the principle of the ten year concession is already accepted in principle, and it is even suggested that a thirty year period may be required to make the air transport firms "fly by themselves."

The whole question of airway subsidies may now receive more attention in this country, and if a plan could be evolved which would not offend American prejudice against subsidies, it might build up commercial aviation in the United States more quickly and at a lower cost than any other form of assistance.

An indirect air subsidy for commercial aviation would probably not be opposed as much as was the shipping project, for the latter would have mainly benefited our coastal regions, whereas an air subsidy would be to the advantage of almost every section of the country.

American Entrants in the Schneider Race

THE news that the National Aeronautic Association has entered three seaplanes in behalf of the United States Navy in the forthcoming Schneider Cup race, the European seaplane speed classic, will be welcomed by all who are eager to see American aircraft participate in foreign contests.

AVIATION, which has been advocating such a course for the past three years, is particularly gratified by the Navy's patriotic stand and hopes that American designing and operating skill will come out with flying colors from this international criterion of seaplane excellency.

Optical Altitude Indicator for Night Landing

By John A. C. Warner

Bureau of Standards

That practical commercial aviation has come to stay must be admitted by even the most skeptical. The rapid advance which the past few years have witnessed is unmistakably the forerunner of greater activity in this comparatively new field of communication and transportation. It is at once evident, however, that the greatest benefit cannot be derived from the use of aircraft as commercial carriers unless their operation can be extended over the full twenty-four hour day; for their inactivity during the hours of darkness robs them to a great extent of their advantage over the systems of ground transportation.

For this reason the problem of flying at night and under other conditions of low visibility is now demanding the attention of many aeronautical experts. We must equip our airways and aircraft with suitable means for surmounting

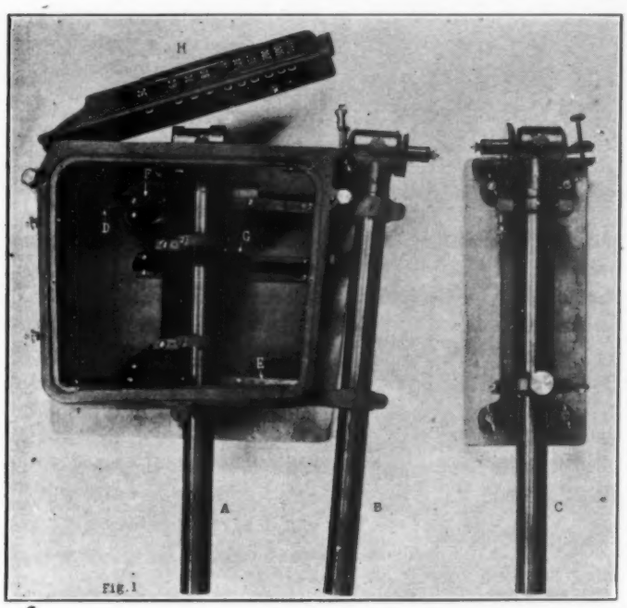


Fig. 1. The Jenkins night altitude indicator

the obstacles offered by these adverse conditions. This of course involves the installation of markers and beacons clearly to define the routes and fields, and also the equipping of aircraft with suitable instruments for navigation and landing. One of the most ingenious of the devices intended for use in night landing, especially emergency landing, is a very simple optical instrument known as the Jenkins night altitude indicator.

Referring to Fig. 1, we note three projectors: *A*, *B*, and *C*, each of which is equipped with an incandescent lamp properly mounted at the upper extremity to project a beam of light downward through the tube to the ground or water upon which a landing is to be made. Two of these projectors: *B* and *C*, are attached rigidly and parallel to each other to the side of the aircraft, while the third, *A*, is made rotatable (upon rails *D* and *E*) through a certain angle in a plane parallel to the fore-and-aft axis of the ship. Motion of *A* is brought about by the aviator who manipulates a handwheel operating through a pinion mating with rack *F*.

Projectors *B* and *C* are each equipped with an object screen which provides a characteristic image on the landing surface; as shown in Fig. 2, a rectangular bar is projected by *B* and two blunt arrowheads by *C*. The ground image from *A* is the altitude figure representing the particular altitude for which the projector is set.

In determining the altitude of the aircraft the pilot simply turns the wheel attached to the pinion mating with rack *F* until the light-beam from *A* intersects that from *C* at the landing surface. As *A* rotates, a toothed metal disc *G* attached to *A* and extending through the walls of the projector tube into the light-beam is caused to rotate in a definite manner by virtue of the action between the teeth of *G* and those of the fixed rack with which they engage. The rotating disc acts as a rotatable object screen, for it is pierced by openings in the form of the altitude numerals corresponding to the particular setting of the projector. Thus it is that the image seen upon the landing surface between the arrowheads projected by *C* is that of the altitude numerals cut in *G*, through which the light passes.

The altitude may also be observed on the transparent scale *H*, for an opening in the case containing the illuminating element of *A* allows a beam of light to fall upon the scale graduation which corresponds to the particular setting of the projector at which the ground images are seen to meet. The intersecting beams (from *A* and *C*) form two sides of a triangle whose altitude, determined with the instrument, is also that of the aircraft above the landing surface.

Inasmuch as 50 ft. is the lowest direct indication of altitude for the instrument described, the illuminated bar image projected by the fixed source *B* is employed in estimating altitudes of less than 50 ft. It will be seen that as the aircraft approaches the ground with all three projectors stationary, the numeral "50" will move from the arrowheads toward the bar image. The prevailing altitude is then estimated by observing the position of the altitude image with respect to the bar and arrowheads. For example, an altitude of 25 ft. would be indicated when the numerals were observed midway between the other two images as shown by Fig. 2. The maximum direct indication of the instrument is 500 ft.

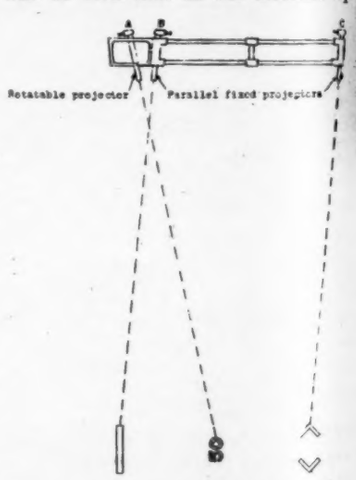


Fig. 2. Image projected by the Jenkins night altitude indicator

The night altitude indicator described has been used in Great Britain. Tests of the instrument conducted in this country have shown satisfactory results.†

The Germans have developed several types very similar in principle to the Jenkins device. One of the most interesting of these involves the projection of a beam downward and forward from a light-source fixed to the tail of the aircraft. Diffusely reflected rays are in turn thrown upward from the landing surface and pass through an optical arrangement in the cockpit where the pilot may observe his altitude by noting the position of a spot of light against a transparent scale.

*N.A.C.A. Technical Note No. 123.

†Bureau of Standards tests conducted in flight and in the laboratory by A. H. Mears and J. B. Peterson.

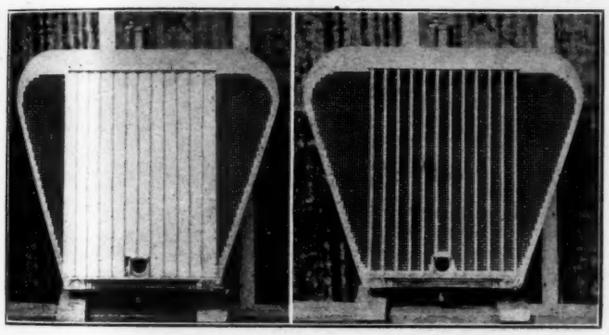
Various possible modifications and improvements of the above instruments are readily apparent. For example, the Jenkins indicator might be simplified by omitting the second projector *(B)* whose advantages are of doubtful iportance; for at altitudes below 50 ft. a pilot would generally prefer to watch the landing area ahead of him rather than to observe the ground images and estimate their relative positions.

Further simplification might be effected by having both projectors *(A* and *C)* fixed to the aircraft in definite positions. In this case the beams of light would intersect at the landing surface for only the one chosen altitude to which the arrangement had been adjusted. Other altitudes might be estimated by noting the separation of the images. For such purposes it would be desirable to have the projected images characteristic of their source; otherwise difficulty would arise in readily determining whether the forward or aft image was leading.

To the writer's knowledge no tests have been conducted in this country to determine the characteristics of the German adaptations as mentioned above. However, one might reasonably doubt the feasibility under all conditions of using the diffusely reflected rays from a landing surface for other than direct observations.

New Type of Radiator Shutter

Aircraft flying under varied climatic conditions require, as pilots well know, a means for varying the exposed area of the engine radiator, else the powerplant will either overheat or freeze. The Engineering Department of the Aeromarine



Light weight radiator shutter, shown closed and open, produced by the Aeromarine Plane & Motor Co.

Plane & Motor Co. of Keyport, N. J., recently developed a radiator shutter built entirely of duralumin and 3s alloy, which is probably the lightest and strongest radiator shutter yet constructed. It has a net area when closed of 340 sq. in. or 2.36 sq. ft. and weighs 3 lb. 6.5 oz., or about 23 oz. per square foot.

The tubing used in the construction is of streamline form and drawn by a particular process adapted by the Aeromarine Company. All duralumin parts are carefully heat treated after manufacture.

This type of shutter is readily adapted to any standard radiator construction, and will shortly be put on the market.

Short-Time Storage of Engines

Valuable instructions for the preparation of aero engines for short-time storage are contained in a technical memorandum recently issued by the Canadian Air Force, which is reproduced below.

Engines should be stored on a suitable stand constructed so that no part of the engine rests on the floor, so that the weight is taken on the correct supporting surfaces and so that the engine can be turned.

Wipe off engine to remove excess oil, dirt, etc. Blow out all water passages with compressed air if available. Insert air hose at water outlet. Pour a quantity of the oil generally used for the engine into each cylinder so as to cover the head of the piston.

On Liberty Engines remove camshaft housing cover, plug at propeller end and pour in one quart of clean engine oil.

Turn the engine very slowly by hand through two complete revolutions of the crank shaft to distribute the oil over the cylinder walls. Fit spark plugs into all cylinders. Grease with mineral jelly all bright parts and all unpainted aluminum parts exposed to the air. Clean oil filters. Clean rotor path in distributor head with light oil and cheese cloth. Coat all parts of breaker mechanism with a light film of melted vaseline applied with a brush. Clean all contacts and parts of magneto.

Fit blank flanges over exhaust ports. Fit covers over all open water pipes, oil plugs, air pipes and gasoline connections. These covers must be such that nothing can be left in the engine when it is subsequently installed in an airplane. Cover whole engine with a sheet or a piece of old fabric.

Label engine with details of work done on it, whether it is serviceable or requires overhauling and of any parts that are missing. Make entries in the log book to the effect that the engine has been prepared for storage, and that oil has been placed in the cylinders.

If possible, rotate the engine once a week during storage.

New British Airway Scheme

An interesting scheme whereby the British public and the Air Ministry would each put up £1,000,000 for developing British airways and for setting British aerial transportation on a sure basis, is outlined in a report issued on Feb. 23 by the Air Ministry. This report puts an entirely new aspect on the future of British airways.

One of the first things which the new Minister, Sir Samuel Hoare, did on his appointment was to ask three eminent business men to form a committee and quite impartially go into the whole question of State assistance to aerial transport. Their recommendation, in short, is to do away with all existing methods and establish one great British air corporation, subsidized over a period of ten years by the Government. In the committee's view, the time has come to tackle the whole question of 100 m.p.h. British airways in a big, broad, business-like way.

What may happen is this: If the report is accepted and acted upon, an air corporation will be formed which will go to the public for an immediate subscription of £500,000 out of a total capital of £1,000,000. To the investor the inducement, apart from the vital national import of successful airway system, will be that the Government in the form of a subsidy, the details of which are to be agreed upon later, will pay to the corporation the sum of £1,000,000 spread over ten years. That will be the corporation's main asset. There is a provision under the committee's recommendations that investors in the ordinary shares should receive a cumulative dividend of 10 per cent per annum.

With this State assistance of £1,000,000 for ten years, the British Air Corporation, having its own capital of £1,000,000, could establish British airways permanently and the Government could then step back and allow the corporation to "fly by itself." It is recommended by the committee that the Air Ministry should exercise a minimum of control over the operations of the corporation, which should act as far as possible upon its own iniative and take its own risks.

The £1,000,000 from the State spread over ten years would not be a gift for the corporation. There is a provision that after the 10 per cent dividend has been satisfied the balance of profits in any given year are to be divided equally between the shareholders and the Government. The Government, therefore, stands to get its £1,000,000 back. The proposed State payment is really in the form of a deferred loan to the company for the joint move.

It is believed in air transport circles that the three existing operating companies, the Handley Page Transport, Instone Air Line and Daimler Company, may come together immediately with a view to presenting some joint scheme to the authorities.

Seaplanes–Present Status of the Question

By C. R Fairey, M.B.E., F.R.Ae.S.

At the Air Conference held in London, England, Feb. 6 and 7, 1923, C. R. Fairey, the British seaplane constructor, read a highly interesting paper in which he dealt with the seaplane from the engineering and operational viewpoints. In view of the important role seaplanes will be called to play in civil air transport over the extended water ways and coastal areas of the United States and also in connection with national defense, Mr. Fairey's paper is reproduced below verbatim except for a few sections which have been summarized. EDITOR.

In his introductory remarks Mr. Fairey pointed out that whereas the design of airplanes early settled down into practically one universal type, the tractor, the seaplane is still an unsettled problem. The two main types of seaplanes—float planes and flying boats—each have their advantages and drawbacks, and preference for one or the other types is chiefly dictated by local conditions.

The main advantages of the flying boat type are light structure weight, large reserve buoyancy of the hull, ample stowage room and accommodation for crew and equipment, ease of mooring and handling on the water, and good view of the pilot—against which there are the following drawbacks: Eccentricity of centers of thrust, gravity and head resistance, coupled with the necessity of carrying down load on the tail; difficulty of beaching; risk of total loss through damage to hull; dependence on wing tip floats for lateral stability in side winds. The float plane type, and in particular the one fitted with twin floats, is on the other hand superior to the flying boat on the following counts: lateral stability on water; concentricity of forces with improved performance and ease of control; ease of handling and repair; compartmented floats with less risk of loss. It has however the following disadvantages: High structure weight percentage; large fuselage stresses set up by floats and tail float; difficulty in mooring and handling on water.

Generally speaking it would appear that the advantage lies with the float type for small machines, and with the flying boat for large ones, but this viewpoint must be modified if any one feature of either type is desired in preference to an average of superiority.

Seaworthiness

The question round which the greatest controversy has raged is that of seaworthiness and this term is not usually properly defined. The conditions of seaworthiness must first be studied and are usually totally different when the machine is under power or if it is to be assumed that the engine has failed and the machine is adrift. The very qualities which make for improvement in the one case are frequently a disadvantage in the other.

If we first consider the case of taking off the water we find it brings out a marked divergence as between the single-step and the two-step types. The two-step endeavors to adhere rigidly to a certain angle of attack on the water and even at considerable speed there is not sufficient air control to regulate this angle through a very large range. With the single-step the machine is not stable on the water fore and aft when hydroplaning and all the control must come from the air surfaces, but a very large range of control is available and can be used by the pilot to ride over a rough sea which the two step type, either boat or float, tends to plunge into. In this connection it is interesting to compare for the twin-float type the difference in behavior between the single step-type of float and the two-step or alternatively the long type of float naturally stable on the water.

Take the case of the single-step type with no buoyancy aft of the step and with the tail end of the machine supported on a quite heavily loaded tail float: the pilot when hydroplaning has the maximum control of the angle of the machine immediately the tail float is lifted clear of the water and the machine is poised upon the area immediately in advance of its single step. There is not even a buoyancy chamber aft as with the intermediate type to interfere with this control. Obviously this type of machine is easy to manipulate over a swell by use of the air controls.

Now considering the type with long floats, the machine will endeavor to maintain its own angle and there is a strong tendency to plunge into an advancing sea. The advantage is obviously with the single-step type.

But when we consider the reverse case, when the engine has stopped and the machine is assumed to be adrift with the sea anchor out and is head on to the sea and drifting astern, it is obvious that the heavy loads imposed on the tail float apply serious stresses to the fuselage at or about the region of the pilot's seat with consequent risk of break up and loss of the machine, and these loads are accentuated by the wind load on the wings which are presented at a considerable angle of attack. In the case of the long float, however, the machine rides on the water without involving any stress on the fuselage other than that due to the weight and the wings are presented to the wind at a lower angle of attack. We have here two opposite cases of seaworthiness in which one type or the other gets the advantage according to the conditions.

When landing on the water the conditions again favor the single-step type as the angular range available can be used by the pilot to make a landing in the best attitude possible and there is no risk of a sea striking the stern of the float so far aft as to cause an upsetting couple throwing the machine over forward.

In connection with taking off on smooth or rough waters it is interesting to note that one of the worst conditions is that of a swell on a smooth sea in practically calm air.

Turning Across Wind

Another important condition for seaworthiness is that of turning across wind. Under these conditions a large upsetting couple is applied to the wings tending to tilt the machine over sideways. This is a maximum at about 45 deg. to the fore-and-aft line of the machine and necessitates in the boat or single-float types the use of very large wing tip floats and gives to the twin-float a considerable advantage.

Other seaworthiness conditions are largely structural and at variance with the structure weight. Large reserve buoyancy in hull and wing tip floats will give greater safety at the price of increased weight and head resistance, and naturally the stronger a float is built and the more bulkheads are included the heavier it must be.

Similarly light fabric covered wings cannot possibly withstand the force of the water when conditions are rough enough for seas to break over them and it is a difficult matter in the boat type to give the lower wing clearance in this respect. The metal cantilever wing is here a great advantage. Fabric covered tail planes and elevators are easily damaged for the same reason.

Undoubtedly the ideal wing would be planked all over and strong enough for a man to walk over. Here there are great possibilities in the cantilever form of wing construction wherein the skin is stressed as part of the structure.

Seaworthiness is largely a matter of size in seaplanes as in ships, and seaplanes cannot reasonably be expected to be any better than their equivalent size in boats and yet flying boats have been successfully handled in a sea which motor boats of equal displacement could not negotiate. In large sizes the improved structure weight of seaplanes will give an available margin of weight to be used for their improvement in seaworthiness and local strength.

The conditions of taxiing or handling at slow speed in relatively smooth water present very little difficulty by the use of suitable water rudder inter-geared with the air rudder. In coming up to an anchorage and for ease in picking up a

mooring the advantage is greatly with the boat type which can be handled in a similar manner to a motor boat.

When used from rivers or lakes of small size many of these seaworthiness conditions do not have to be studied and the corresponding saving in structure weight can be used to the advantage of the machine in load carried or performance, which is also desirable from the point of view of quick take-off with a view to clearing trees or obstacles on the banks.

Handling

The present methods of handling seaplanes, in launching and bringing them ashore, can be described as deplorable, and is the chief obstruction to their greater use and until these methods are improved must be a bar to their commercial use except in certain special cases. I refer to the use of inclined slipways coupled with beach axles. The machine is brought up to the slipway and a special beach axle shaped to the bottom of the float or hull is attached in position underneath it by men in waders. The machine is then hauled ashore by winches or man-power. The reverse case is used in launching and the machine is retained on the beach axle for the purpose of handling on land.

For small or large machines the method has hardly been improved in ten years and the resulting damage to machines and the expense of operation accounts not only for the unpopularity of seaplanes for certain operations but also for the nearly prohibitive cost. Many improvements have been suggested, some highly practicable of which only a few can be mentioned.

For small machines in sheltered water the tidal slipway designed by Oswald Short is one of the best and most practicable methods. In this a pier extends out into the river or harbor and attached to its end is a floating pontoon of such size that when a seaplane is alongside and broadside on, the wing tip clears the pier. The pontoon is anchored to the pier but arranged to rise or fall with the tide. A large crane with sufficient throw on the arm launches the machine in the water clear of the slipway so that the machine can be brought up in any state of the tide for loading or unloading without the use of waders or undue amount of labor.

In view of the fact that for pure seaplane purposes the amphibian has certain disadvantages as to weight and head resistance it would seem possible for ordinary seaplanes to mount small wheels in the floats themselves of insufficient size to cause serious resistance in the water, to be used in place of the beach axle. These wheels which would not be large enough to enable the machine to be used as a true amphibian would give all its advantages in this respect but without the corresponding disadvantage of increased weight or water resistance.

Another very practical suggestion, also due to Mr. Short, is that of the floating shed which is mounted on pontoons and has a hinged slipway projecting into the water. The machine is taxied on to the slipway which can be lifted by compressed air. Similar sheds in which the machine is floated direct under cover are also possible.

For large machines with proper anchorage there is no necessity for bringing them ashore after every flight, but as such machines are preferably housed under cover it would be a great advantage for stations to be constructed with canals leading right into the sheds in place of roads and a system of lochs for bringing the machines in. If it were desired to have access to the hull below the water-line it would be possible to arrange for the pumping out of the basins inside the shed so that the machine could be settled down on the proper shaped stocks. This would have the advantage that the process of getting the more or less delicate hull supported would be done with the machine not exposed to the wind. The original cost of such a station would be repaid by the decreased amount of damage to hulls when handled by present methods. A good step in this direction is the Admiralty experimental floating slipway now under test and a further experiment is being carried out with a beachtrolley for larger machines fitted with floats controlled by compressed air and arranged to be submerged under the machine.

Although in some situations seaplanes can be moored for long periods, and are best operated from moorings, it is essential that such a mooring should be extremely strong. No anchor of sufficient weight can be carried on the machine itself since mooring a fully rigged seaplane is analogous to mooring a yacht with the sails set and there is the further objection that considerable water soakage takes place and materially increases the weight of the hull. With improved float construction and possibly with the use of metal hulls it is possible this objection will be overcome.

The question of handling seaplanes is one of the greatest importance since small machines cannot be moored for long periods. In fact large boats of the F. type* have been known to "kite" at their moorings in a gale and until the mechanical difficulties of reefing or folding wings on the water can be overcome with the resulting increased difficulties of stability when so folded or reefed, proper housing is essential except in very sheltered places.

The seaplane pilot when landing head to wind may be dead across a tide of 8 or 10 knots which would be equivalent to landing with considerable drift. It is a remarkable fact that experienced seaplane pilots appear to be able to see the tide even in unknown harbors and to make a correct landing splitting the difference between wind and water speed.

Problems of Design

It is, of course, impossible in the scope of a single paper to deal with even a small fraction of the problems in seaplane design. The writer only proposes to touch on one or two outstanding points which most affect the comparison with the airplane.

The principal features that affect the design of seaplanes as compared with airplanes are, the water resistance of the hull or floats which in addition to imposing limits on the surface and power loading have considerable effect on the propeller design, and the influence that type, arrangement, and dimensions have on the structural weight. Each type of seaplane has its special problems in stability, control and strength of structure.

It is a common characteristic of all usual float or hull forms that the resistance rises rapidly with the speed to an initial maximum known as the "hump" speed after which the resistance falls more or less and as the total weight is by then partially air-borne and the propeller efficiency is improving with the speed the worst condition in taking off the water usually rises at or about this speed. Some hull shapes develop two such "humps".

Effects of "Hump Speed"

The hump speed has two principal effects on the machine design. In the first case a margin of power must be allowed so that the machine can pass the hump speed with a reasonable acceleration and this in itself is a limiting factor as to the total weight per hp. to be carried. Secondly, it affects the propeller design owing to the necessity for obtaining considerable thrust at low forward speeds with correspondingly bad effect on the top speed of the machine.

Assuming that machine and propeller are designed for taking off on smooth water in a flat calm it will be satisfactory under most average conditions. Conditions likely to prevent the machine leaving the water are either rough water or the case mentioned before of a swell and a flat calm.

With early seaplanes the hump speed curve projected through that of the power available in nearly every case. I have found in practice that such a machine will give little or no trouble in taking off, although theoretically it cannot leave the water at all. On the other hand a machine whose power required clings closely to, but does not necessarily project through, the power available curve is much more difficult in operation. It would appear to be a question of acceleration rather than actual power. In the first case the machine passes through the hump speed with a momentum acquired by early acceleration and in the second case the machine is unable to accelerate sufficiently to realize this condition.

This feature of the water resistance is the principal one in which the designs of seaplanes are limited in comparison with that of airplanes, for in addition to the necessary power to overcome it, it is impossible to use the most efficient propeller from the point of view of speed. Further, in order to obtain a propeller that shall give a high thrust at low speed

*This type corresponds roughly to our F5L type.—EDITOR

it is necessary to use larger a diameter than would be the case for the land machine propeller. This again reacts on the machine by increased weight of chassis to give the required clearance and the large propeller diameter hampers certain seaworthiness conditions as mentioned previously.

In one respect the large diameter and low pitch of the propeller are no disadvantage and as will be noted from the curves it results in an improved climb after the machine has left the water.

This question could be dealt with in two ways—one by the variable pitch propeller on which experiment is now taking place. Given control on the pitch very much improved results could be obtained and greater loads lifted for a given power. An alternative, and seemingly easier solution, would be the provision of a two-speed gear on the engine, the gear ratios being arranged so as to give maximum engine revolutions under two conditions (1) at hump speed for the machine (2) at maximum or cruising speed according to which was desired.

This is a course I have been advocating for some time and I would take this opportunity to impress upon engine designers the urgent need of this feature for seaplane work. It would seem that an engine fitted with an epicyclic gear would be particularly adaptable for this purpose as it would avoid the necessity of a clutch or gear-changing mechanism. The alternative gear could be engaged by means of a brake-band exactly in the manner of a Ford car and the only necessary operation by the pilot would be to hold in a low gear until the machine had passed the hump speed.

Mr. Fairey here showed a set of curves indicating the structure weight of some representative seaplanes and airplanes. These curves appear to illustrate the lecturer's contention that the average advantage lies with the float type for small machine, and with the boat type for large ones. They also seem to indicate that large flying boats should be superior in performance to large airplanes, for while the structure weight curve of the flying boat starts at a very great disadvantage to the airplane, it overhauls it in medium sizes, and passes it in large sizes, with no sign of the curve "turning up" in the case of the biggest flying boat built to date. This would indicate that the size limit for big flying boats is far from reached, whereas that of airplanes, while not necessarily in view, will probably be met first.

The difficulties in handling large airplanes are tremendous, for they require unduly large airdromes which must have a hard surface when most flat country suitable for airdromes is of a soft nature. Flying boats, on the other hand, dispose of unlimited airdromes as long as they fly over water, nor do they need the rate of climb for safety in taking off that an airplane does. Finally, big flying boats do not present the difficulties in handling which big airplanes do.

Only practical experience of conditions in operation will provide designers with data on which to improve still further all classes of machine and there is not nearly enough information of this kind available. This case applies more particularly to seaplanes than to general airplane design. Questions of seaworthiness, handling, etc. can only be solved by full-scale experiment. Even after ten years of seaplane flying there has as yet been no proper comparison ever made of the relative seaworthiness qualities of various types. Such questions as landing and handling in rough seas are still largely a matter of speculation. A great step in this direction has been made by the recent formation of the Development Squadron of the Royal Air Force and this scheme should provide exactly what is wanted by the designers if carried out on a sufficient scale.

CHARACTERISTICS OF SOME MODERN SEAPLANES

FLYING BOATS
Single Step Type

Type	Gross wt. lb.	Useful load lb.	Structural weight lb.	Structural weight %	Wt./hp. lb.	Wt./sq. ft. lb.
Besson Triplane	1910	590	955	50	14.5	5.9
NT2B	3169	848	1470	46	14.95	7.1
Macchi	3540	1100	1560	44	14.2	7.3
Farman 450 hp.	6380	2200	2600	40	14.2	7.2
NC4 1600 hp.	28000	129000	9800	35	16.7	11.7

FLYING BOATS
Two-Step Type

Type	Gross wt. lb.	Useful load lb.	Structural weight lb.	Structural weight %	Wt./hp. lb.	Wt./sq. ft. lb.
Supermarine Schneider Cup Winner (1922)	3274	800	1110	34	6.9	
Nieuport	3850	1325	1735	45	19	7.6
Dornier	4400	1440	1800	41	23.8	8.8
Savoia S16	4620	1760	1850	40	16	8.1
Supermarine Seagull	5680	2000	2180	38.4	12.2	
" Amphibian	5700	1960	2280	40	16.2	
Viking IV "	5675	1872	2121	37.4	12	9.4
F3	11900	4250	4750	39.8	16.5	7.3
P5	12055	4700	4330	35.8	16.75	
Short Cromarty	19700	7412	7310	37.1	18.75	8.77
Felixstowe Fury	27700	11500	9200	33.2	15.4	8.75
Atalanta N4	32000	11700	10300	32.2	12.3	11.1

FLOAT SEAPLANES
Twin Float—Single Step Type

Type	Gross wt. lb.	Useful load lb.	Structural weight lb.	Structural weight %	Wt./hp. lb.	Wt./sq. ft. lb.
PV2	1590	503	787	49.5	15.9	9.5
PV2Bis	1702	491	911	53.5	17	9.5
184 Short	4500	1020	2080	46.3	18	6.5
Ricci R1C	10600	4000	4230	40	15	8.2

FLOAT SEAPLANES
Twin Float—Double Step Type

Type	Gross wt. lb.	Useful load lb.	Structural weight lb.	Structural weight %	Wt./hp. lb.	Wt./sq. ft. lb.
PV5a	2518	546	1217	48.3	12.6	8.1
Fairey Pintail III (Amphibian)	4700	1350	1950	41.5	10	10.7
Caudron	6750	2000	3200	47.5	17.4	7.2

FLOAT SEAPLANES
Twin Float Type, intermediate between the Single Step and the Double Step Types

Type	Gross wt. lb.	Useful load lb.	Structural weight lb.	Structural weight %	Wt./hp. lb.	Wt./sq. ft. lb.
Avro Polar Expedition	1589	589	687	43.2	18.7	9.23
PV9	1965	561	960	49	13.1	8.65
Avro Viper	2567	604	1170	45.5	12.2	7.92
L.V.G.W11	2650	650	1220	46		
Junkers (Duralumin construction).	3120	1105	1100	35.4		
L.V.G.W1	3460	810	1370	39.5		
L.F.G. V20	3475	1275	1320	38		
Short N2b	4938	1586	1852	37.5	14.3	7.05
Fairey III D	5050	1650	2020	40	14	10
Fairey Atlantic II	7150	3100	2600	36.3	20	10

New York Air Defense Stations

Owing to the reluctance of the City of New York to sell to the Navy Department the piece of land on which Rockaway naval air station is situated, that station is in a state of suspended animation, and the Navy has no aircraft operating base in New York. The only air defense stations near New York are Mitchel Field, near Garden City, L. I., which is operated by the Army Air Service, and Miller Field, Newdorp, Staten Island, the station of the New York National Guard Air Service.

With this situation in view, the Aeromarine Plane and Motor Co. is making extensive alterations at its plant in Keyport, N. J., to turn it into a well equipped reserve air defense station. In addition to the excellent facilities for overwater aircraft a large landing field is being built which, in conjunction with the present fully equipped plant where planes, motors, propellers, wings, etc., are now being manufactured, will make a strong fighting air base. Work is being rushed so that when the Army Air Service theoretically bombs New York next summer with several squadrons of bombing planes, the Aeromarine plant will be able to be used as an important point of mobilization for the defense squadron.

The Army Air Service is planning this demonstration in an effort to awaken the citizens of New York to the defenselessness of their city.

New Belgian Air Line

A new Belgian Air Line, the S.A.B.E.N.A., will shortly inaugurate an airway service between Brussels and London, with an extension to Cologne. Later it is proposed to create a service between Antwerp, Brussels, Strasbourg and Basel, and in the Belgian Congo between Matadi and Elisabethville. The latter service will not begin to operate before 1924.

Are Huge Aircraft Carriers Worth While?

Well Known English Naval Writer Voices Warning

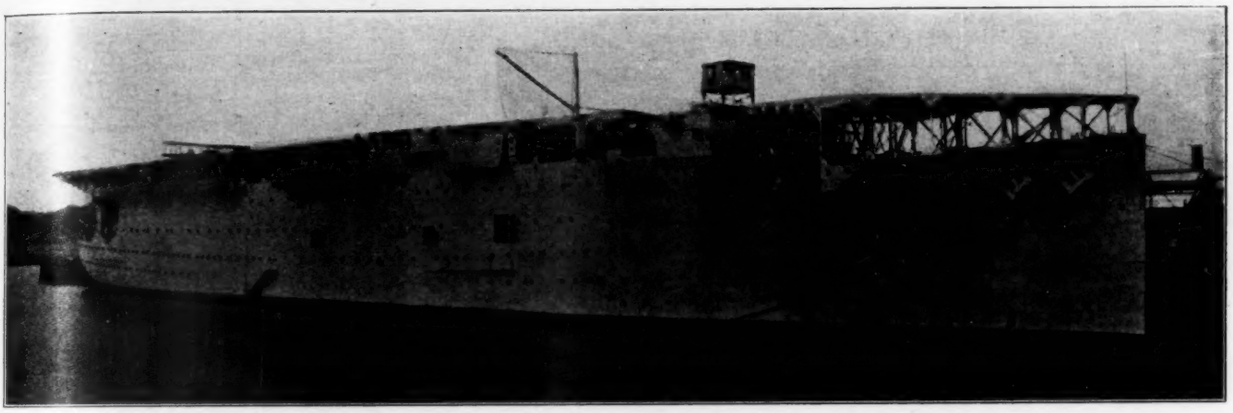
The following article which Hector C. Bywater, the English naval writer contributes to the Scientific American of March, 1923, contains interesting views on the useful size of aircraft carriers.—EDITOR.

The description published in this journal dated December last, of the changes made in the design of the battle cruisers "Lexington" and "Saratoga" to equip them for their new rôle as aircraft carriers, raises anew a question which has been discussed in British naval circles for some time past, namely, whether it is sound policy to employ as floating airdromes vessels of very large dimensions. As the arguments against this policy certainly appear to deserve consideration, it may be worth while to summarize them here.

(1) Huge aircraft carriers are to be deprecated on economical grounds. As each unit cost a great deal of money, the total number of such vessels must in any case be limited, irrespective of the restriction imposed by the Washington agreement. Would it not be better to build three medium or four comparatively small carriers in place of two very large ones? For the cost of building one "Lexington" it would, no doubt, be possible to build two ships of the British "Hermes" type, 10,950 tons. Moreover, to concentrate practically one-half of the aviation material of the fleet into one ship is to put "all the eggs in one basket," and a somewhat fragile basket at that. A ship cannot be in more than one place at a time, and it is not difficult to visualize occasions when the possession of one or two additional aircraft carriers would make all the difference between success and failure in executing some problem of strategy or tactics. Another fact to be remembered is that the enemy would naturally make a determined attempt to destroy or disable these huge floating airdromes, knowing that the loss of one would be a terrible blow to the other side by depriving it of half its air force and thus rendering it partially blind. For this reason such ships would become the target for concentrated attack by submarines, aircraft and other weapons.

(2) The aircraft carrier is exceedingly vulnerable, in that superficial injury which would not impair the fighting power of an ordinary battleship or cruiser might put the carrier out of action. If the flying-off deck were holed by bombs or bursting shell, even of small caliber, machines could no longer alight on it, and the power to do this is the chief justification for building very large carriers. The spacious deck of the "Lexington," for instance, would present an inviting mark for bombing airplanes and long-range gunfire, and one direct hit might tear a huge gap in the light plating, making it a death trap to descending machines. The recent experiments with the British battleship "Agamemnon," which was bombed from the air when steaming at 15 knots under radio control, showed that a good percentage of hits can be reckoned with even when the attacking planes keep at a great height. The "Lexington" would, of course, offer a target nearly four times as large, and in time of war attacking planes will take big risks in order to get their bombs fairly on the mark.

(3) The only advantage the "Lexington" has over the "Hermes," a ship of two-thirds less displacement, is her ability to act as a landing ground for homing airplanes and her greater capacity for housing planes; but the first advantage might be nullified by a lucky hit in the opening engagement of the war, while if the ship were sunk the loss of aviation material would be proportionately greater. In any case, many naval officers regard it as unnecessary to make special provision for the landing on deck of airplanes after flight. This is no easy performance under the most favorable conditions prevailing in peace; it would be infinitely harder to accomplish under the conditions of battle, with the carrier probably steaming at full speed, making frequent changes of course, perhaps under a heavy fire and half obscured by shell splashes and powder fumes. The probability is, therefore, that in time of war an airplane which had once left the carrier could not return to it, and must either be abandoned or left in the water until an opportunity occurred for salving it. If this view be accepted, the principal argument in favor of huge floating airdromes ceases to have any point for airplanes can be launched with ease and safety from ships of relatively small dimensions, as has been proved in actual practice.



H.M.S. Argus, the most successful British aircraft carrier, which has a through flush deck for taking off and landing. Its great vulnerability to aircraft bombs is obvious, considering the size of the target

The British Navy has two big aircraft carriers: the "Eagle," an ex-battleship of 22,790 tons; and the "Furious," ex-battle cruiser, of 19,100 tons. But its more successful carrier is the "Argus," of 14,450 tons, and it is significant that in the "Hermes," the first ship *specially designed* for this purpose, and not converted as the others were, the Admiralty did not go above 10,950 tons. The impression in Europe is that the former American and Japanese battle cruisers are being transformed into aircraft carriers less on account of their inherent fitness for this work than because it furnished a means of saving these valuable ships from the junkpile and adding floating airdromes to the respective navies more quickly than would have been possible if entirely new ships had to be designed. Probably, also, it was easier to obtain appropriations for converting the half-finished ships in question than for new construction.

Value of Gliders to Aeronautical Progress

Their Importance in Solving Technical Problems

An interesting paper on "Gliders and their Value to Aeronautical Progress" was read at the recent Air Conference held in London, England, Feb. 8, by Col. Alec Ogilvie, C.B.E. Restrictions of space unfortunately prevent a reproduction of the entire paper except for the conclusions which are given below.

Our readers will be interested to learn that Colonel Ogilvie actively participated in the gliding experiments which Orville Wright undertook in the fall of 1911 at Kitty Hawk, N. C. The longest glide made then was just under 10 minutes, which took place in a high wind of 40 m.p.h. The gliding experiments made in the Rhön hills were carried out in much lighter winds, 15 to 20 m.p.h. and on the face of a hill with fairly easy gradients. These conditions which demanded a much higher degree of aerodynamic efficiency, which explains why three years passed before flights of 20 minutes duration could be accomplished. EDITOR.

There would appear to be very little likelihood that engineless airplanes can ever be of practical service in journeying from place to place or even that they will be much used for sport. The necessity of an up current of some kind to support the machine renders the first almost impossible and confines the second to special localities. The sport of motor cycling would be a tame affair if it were limited to hill climbing up special hills.

Present Possibilities

There are possibilities in the use of gliders for purposes of training pilots and there are certainly possibilities in the development of small sporting machines of 15 to 20 hp. capable of horizontal flight with 5 hp. and doing 100 miles or so to the gallon, but the real immediate value of gliders lies as it always has done in the opportunity they afford of technical experiment in a simple and inexpensive manner.

In experiments with engine driven airplanes, the horsepower of the engine and the efficiency of the propeller are always difficult to estimate exactly. The detail design has to be carried out with care and attention in order to keep the percentage of weight of the structure within fairly close limits, while the cost of the experimental work is almost prohibitive to private firms.

On the other hand, with gliders the motive power, which is the force of gravity, is perfectly definite in amount and always reliable, and for many purposes the machine can be built in a simple, rough and ready manner as long as the external form is correct.

Solving Two Technical Problems

There are two main technical problems in the commercial airplane of the day and it is suggested that solutions of either or of both are more likely to be found by means of experimental work with gliders than by other means.

The first is the increasing of aerodynamic efficiency, to enable considerably greater loads to be carried for the same power or the same load with less power. The overall efficiency, the ratio of lift to drag, or in other words the inverse of the gliding angle of the commercial airplane of the day is about 8 to 1, in some cases even less. To put the result in another way, about 60 hp. is required to carry each individual passenger for the usual 3 hr. journey at a speed which is necessary to combat the normal wind conditions. This is obviously a very high figure and gives an indication of the reason for the high cost of aerial transport. It should be noted that in addition to the heavy fuel costs entailed by this poor efficiency, there are heavy capital and insurance costs, all of which would come down if the overall efficiency could be increased, as it is perfectly certain it could be provided that an adequate amount of experimental work can be done.

The second problem for solution is the improvement of controllability at low flying speeds, so that in the event of an engine stoppage, the airplane can be landed in awkward fields with greater safety than at present.

It is well known to aeronautical engineers that an airplane, the stalling speed of which has been tested to be say 50 m.p.h. in good weather on a large airdrome, is never, in the event of a forced landing, glided in at a speed of less than 60 m.p.h. This additional 20 per cent over the stalling speed adds greatly to the difficulties of the landing and to the shock in the case of an accident and would be entirely unnecessary if the pilot had an airplane over which even in gusty weather he had complete control right down to the stalling speed. This difficulty is such a commonplace among pilots that it does not occur to them to worry about it, but it is a problem to which a great deal of attention is being paid and to an attack on which the Aeronautical Research Committee is devoting a considerable amount of the resources at its disposal. The recent gliding competition at Itford Hill showed how much room there was for improvement in the controllability of the airplanes entered, and instilled a belief that other competitions would cheaply and quickly effect such improvement.

There can be little doubt that these are only two instances out of many where we have good reason to expect substantial progress in aeronautics by means of experimental work with gliders.

An Appeal to Businessmen

The writer would conclude by an appeal to business men who are interested in civil aeronautics, whether from a financial point of view or otherwise, to put up prizes and so to stimulate competition among a large number of brains toward a solution of the problems which must be solved before commercial aviation, ultimately to be a necessary bulwark of the country, can become the practical economic proposition, which is the earnest hope of all present.

New German Glider

Darmstadt glider "Senator," flown by Herr Förstner at the gliding meet at St. Andreasberg, Germany. Notice air speed indicator mounted in front of the pilot's seat on a streamlined arm. How the pilot climbs into the cockpit is not apparent from this photograph

The Future in the Air

Airplane history was made at Selfridge Field, near Detroit, Mich., recently, when every speed record for airplanes was broken by a large margin. Lieut. Russel L. Maughan, of the Army Air Service, flew his plane at the rate of 248.6 m.p.h.; in other words, he was traveling a little faster than four miles per minute. His average for eight flights, four with and four against the wind, was 229 m.p.h.

Such speeds, if they could be maintained, would bring distant places on the earth very close together. The airline distance from London to New York is 3471 miles. The difference in time between London and New York is nearly five hours. If a plane could maintain the average speed made by Lieutenant Maughan a man could leave London at seven o'clock in the morning and land at New York at five o'clock the same afternoon, or leave New York at seven o'clock in the morning and land at San Francisco at two o'clock on the afternoon of the same day.

The Army Air Service entered planes in these speed contests not alone for the purpose of breaking records but in order that they might learn much of real value. In no way except by actual trial under severe conditions can the characteristics of aircraft be determined with accuracy. Experience has shown that high speed is absolutely essential in military fighting planes. There is, however, probably a limiting speed beyond which it will be impossible for the pilot to endure the strain, beyond which he cannot both fly and fight.

Not many weeks ago two officers of the Army Air Service remained in the air in an airplane for more than thirty-five hours. This was an unsurpassed endurance record; but, best of all, it showed us by a practical test that we had been able to build and to operate engines that were capable of such a performance. This means that long cross-country flights may hereafter be attempted with much greater assurance that the aircraft will be equal to their performance. One of the same pilots who successfully completed the endurance test had previously secured another record of equal importance. He had climbed in an airplane to an altitude of more than seven miles. We thus learned for the first time the atmospheric conditions at such a height, their effect upon the airplane, upon its power plant, and upon its occupant. We now know fairly well by actual test what must be done to make it possible for man to navigate the air at such an altitude, and the changes that must be incorporated in the ordinary airplane in order that it may fly at these great heights.

Army Air Service pilots now hold every airplane record for speed, for endurance and for altitude. This shows not only that they are skillful flyers but also that the technical development of aircraft and engines in the United States is at least as far advanced as in any other country. It is a fact, however, that this country, where man first flew, is now lagging far behind others in using this new means of transportation and communication. And yet there is no country in the world where the advantages are greater or more apparent.

In addition to the speed contests in Detroit there were others for weight-carrying airplanes, to determine the speed and reliability of aircraft adapted not alone for military but also for commercial purposes. It was thoroughly demonstrated that when aircraft are properly built, properly maintained and flown by skilled personnel, they are capable of carrying passengers and freight safely and speedily over the long routes between distant points in the United States. Why, then, are they not used? It is true that there have been many accidents. Is this the sole or main reason for the lack of air-transportation companies? In the early days of railroads accidents were at least as frequent, and the loss of life many times greater. Though even now accidents on the railroads are not unknown, they have been greatly lessened because of legislation requiring installation of safety devices and compliance with other rigid rules.

Taking a lesson from the past, those who are interested in the development of commercial aërial transportation are praying for legislation that will place in the Federal Government the control of all flying. This means that the Government must license aircraft and aircraft pilots, just as it now licenses steam vessels and their masters and pilots. A bill embodying these provisions has already passed the Senate, but when this was written had not yet been reported in the House. Should it pass, no aircraft could leave the ground or water until it had been inspected and pronounced airworthy, nor unless its pilot had passed an examination and had been duly declared proficient and fit to fly. When this bill becomes a law there will be less difficulty in securing insurance—flying will be safer. With airways properly marked by day and lighted by night, with landing fields at proper intervals, travel by air will become a matter of course and probably even safer than in railroad trains or in automobiles.

It is a commonplace among military men that the next war will be won in the air. The nation without an adequate air force will be absolutely helpless, and it is likewise true that without a commercial air fleet it will be outstripped by its rivals in the markets of the world.

The development of aircraft and of air transportation is necessary if we are to maintain our economic and our national independence.—*The Saturday Evening Post, Feb. 17, 1923*

Curtiss Stockholders

At the annual meeting of the Curtis Aeroplane & Motor Corp., retiring directors were reelected, and Arthur H. Marks, New York, President of Skinner Organ Co., and former President of Diamond Rubber Co., was elected a director to fill a vacancy.

The operating results of the company for the year 1922, subject to audit by Price, Waterhouse & Co., and therefore, subject to minor change, showed a profit of $16,169.94, compared with the profit of $101,207.17, for 1921.

Orders on the books at the close of the year amounted to $3,752,009.02, as compared with $1,763,224.55, in 1921.

The policy of concentrating the efforts of the corporation on engineering, which was inaugurated when the present management took control of the corporation in 1920, culminated during the year in the establishment of a new method of cooling motors and in the winning of the Pulitzer Race, in which Curtiss ships finished first, second, third, and fourth, all four making world's records for a closed course.

This success is directly responsible for the re-entrance of the corporation into motor building on a substantial scale. This, in turn, has resulted in the re-opening of a part of the Buffalo factory so that this unit, instead of being a burden on the company's finances, should be in 1923, the most profitable part of the company's plant.

The policies of the company will remain unchanged throughout 1923. It is necessary to revise the capitalization of the company and a plan to this effect will be submitted to the stockholders shortly for their approval. It may also be necessary, in view of the larger volume of business being transacted, to arrange for the raising of working capital. The possible need for this is reflected in a decrease of cash on hand at the close of the year from $994,880.52 in 1921, to $174,744.12 in 1922, and an increase of the Government work in production from $122,629.81 in 1921, to $791,978.62 in 1922.

Austrian Gliding Efforts

As construction of power aircraft in Austria was until recently forbidden by the Peace Treaty, former military aviators in that country have turned their attention to motorless planes, according to a report to the Commerce Department from Consul R. W. Heingartner, Vienna. In consequence the construction and operation of gliders is assuming considerable importance.

A competition is to be held in the spring, probably near Vienna, as the hilly nature of the country surrounding the city is favorable for sailing flights. The Austrian Aero Club is reported to have a large fund at its disposal, and the members are very active in preparing for the competition. The automotive section of the Vienna technical high school has for some time been working on a motorless plane. The work is being done by high school students.

Aviation in Congress

(67th Congress, 4th Session)

Jan. 7, 1923 — Feb. 10, 1923

Jan. 8, House.

Mr. Winslow: a bill (H.R. 13715) to create a bureau of civil aeronautics in the Department of Commerce, encourage and regulate the navigation of civil aircraft, and for other purposes; to the Committee on Interstate and Foreign Commerce.

Jan. 11, Senate.

Mr. Willis: a bill (S. 4325) to authorize the sale of certain Government property and appropriating the proceeds thereof for the erection of buildings and the purchase and installation of equipment for use of the engineering division of the Air Service of the Army; to the Committee on Military Affairs.

House.

In discussing the Independent Offices Appropriation Bill (H.R. 13696), the appropriation for the National Advisory Committee for Aeronautics was under discussion. During the debate Mr. Tilson drew attention to the great need of federal regulation of flying. The work of the N.A.C.A. in experimentation and research was emphasized.

Jan. 16, House.

Mr. Steenerson: Committee on the Post Office and Post Roads H.R. 11193. A bill to encourage commercial aviation and authorizing the Postmaster General to Contract for air mail service and prescribing rates of transportation and postage thereon; with amendment (Rept. No. 1421). Referred to the Committee of the Whole House on the state of the union.

Jan. 17, House.

An amendment providing for an aviation increase to enlisted men of the Army, $200,000 and that hereafter the authorization for increase in flying pay contained in section 13-A of the Act of June 4, 1920 shall be construed to include warrant officers of the Army * * * * Lost on point of order that it was legislation on an appropriation bill. An appropriation of $12,426,000 passed the House for aviation. This amount is $245,300 short of the budget amount and a decrease of $274,000 from current appropriations. The committee reduced the item of experimental development about $200,000.

Jan. 18, House.

Army Appropriation Bill (H.R. 13793). An amendment was made and agreed to "Provided further, that none of the funds appropriated under the title shall be used for the purpose of giving exhibitions to the public other than those under the control and direction of the War Department, upon government flying fields and no public exhibitions shall be given unless a bond of indemnity in such sum as the Secretary of War may require from damages to person or property shall be furnished by the government by the parties desiring the exhibition."

Jan. 19, Senate.

Remarks and letters in the U. S. Senate regarding the reduction of the National Advisory Committee for Aeronautics appropriation. The appropriation was cut from $270,000 to $247,000 by the Senate Committee.

Jan. 22, Senate.

Amendment of Senator Lodge providing for additional pay for officers of the staff department who made aerial flights, prior to Aug. 1, 1921.

Jan. 25, House.

Report of the House Judiciary Committee exonerating Attorney General Daugherty of impeachment charges.

Jan. 26, House.

Mr. Stevenson: a bill (H.R. 14038) to amend the laws relating to the postal service system, authorizing rural routes from 36 to 75 miles in length, to encourage commercial aviation, extending the insurance and collect-on-delivery privilege to third-class matter, and prescribing the computation of overtime to employes in post offices; to the Committee on the Post Office and Post Roads.

Jan. 29, House.

H.R. 6204. An act to grant the military target range of Lincoln County, Okla. to the city of Chandler, Okla. and reserving the right to use for military and aviation purposes, deferred.

Jan. 30, Senate.

Mr. Borah submitted resolution for the proposed International Conference on economic problems.

Jan. 31, House.

Mr. Hicks: Committee on Naval Affairs. H.R. 14086. A bill authorizing the acquisition of certain sites for naval aviation stations; without amendment (Rept. No. 1495). Referred to the Committee of the Whole House on the State of the Union.

Feb. 1, House.

Change of reference. Underclause 3 of rule XXII, the bill (H.R. 11549) authorizing the conservation, production, and exploitation of helium gas, a mineral resource pertaining to the national defense, and the development of commercial aeronautics, and for other purposes, was reported from the Committee on the Public Lands and referred to the Committee on Military Affairs.

Feb. 5, Senate.

Senator Wadsworth discusses the progress made in aviation. Senator King asks whether any attempt has been made by the administration to consolidate the Army and Navy Air Services.

House.

H.R. 11193, to encourage commercial aviation and authorizing the Postmaster General to contract for air mail service, and prescribing rate of transportation and postage thereon. Object to as being too important to be considered on the Unanimous consent calendar.

—Aeronautical Chamber of Commerce

Rivalry for U. S. Glider Meet

An international glider contest which is to be held in the United States this year under the auspices of the National Aeronautic Association is arousing the keenest sort of rivalry among cities and towns throughout the country. Oakland, Calif., with the offer of a $5,000 trophy now leads the contenders for the meet. Strong claims have been put forward by cities in Maryland, Michigan, Georgia, Massachusetts and New Hampshire.

In presenting claims of Oakland, Calif., Mayor John L. Davie stated that he has the cooperation of a special committee of aviators from the Oakland Flying Club and declared that the field at Berkeley, north of Oakland, was the equal of the famous Downs Field in England. In order to leave no doubt about the favorable conditions offered, the Mayor filed aerial photographs of the site with its unobstructed slope of nearly three miles and statistics from meteorological experts showing wind and weather averages. Reports of special tests with a glider weighing 510 lb. were also submitted.

The gliding committee of the National Aeronautic Association which is headed by Orville Wright, will shortly meet in Washington to consider the claims submitted for consideration in selecting a site for the 1923 competition that will bring to this country contestants from all parts of the world.

Capt. E. V. Rickenbacker has presented a valuable glider trophy to be awarded at the international meet by the National Aeronautic Association on behalf of the donor.

Mexican Airways

The latest available issue of *Tohtli*, the Mexican aeronautical monthly, which has just completed its seventh year of publication, contains some interesting information of Mexican Civil Aviation.

A concession to operate civil airway services was granted by the Department of Communications and Public Works on July 21, 1921, to Harry J. Lawson and L. A. Winship. The two concessionaires incorporated shortly afterward the Mexican Aerial Transportation Co. and last year started to operate a mail and passenger service between Mexico City, Tuxpan and Tampico, using Lincoln-Standard airplanes fitted with Hispano-Suiza engines. This airway is particularly important on account of the large volume of business being transacted in the region by the American oil interests. Altogether 39 trips have been made on the Mexico-Tampico line, and 68 trips on the Mexico-Tuxpan line in addition to various flights made to other cities, in particular Ciudad Victoria and Monterrey.

Flying operations were hampered to some extent by the lack of landing fields, and with a view to overcome this drawback the company has so far established sixteen landing fields which are located at the following places: Chihuahua, Jimenez, Torreon, Monterrey, Saltillo, Morelia, Leon, Guanajuato, Colima, Tepic, Mazatlan, Tampico, Tuxpan, Ciudad Victoria, Alvarado, Tlacotalpan and Oaxaca. Reference to a map would seem to indicate that the company intends to develop two trunk airways leading to the United States: one would follow the line of the Northern Railroad of Mexico from Mexico City to Juarez, while the other airway, which already is partly in operation, leads by way of Tampico, Victoria and Monterrey to Laredo, where it could be linked up with an American service running by way of Fort Worth or Dallas to St. Louis.

With a view to popularizing air travel, the Mexican Aerial Transportation Co. has underaken numerous propaganda and exhibition flights in various parts of the Southern Republic, and it speaks well for its personnel that not a single accident has marred this work. As under a clause of its concession the company must employ within a given time a certain proportion of Mexican personnel, a flying training school was organized at Tampico, where the first Mexican civil pilot, Sr. Manuel Guzman, recently graduated. The company has also organized repair shops which are equipped for the manufacture of propellers and landing gears, and which are capable of taking care of all emergencies occurring in flying operations.

A Letter

Regarding Landing Field Nomenclature

Editor, AVIATION:—

I have examined with interest the landing field nomenclature proposed by Messrs. Archibald and Donald R. Black in AVIATION for Feb. 12. Although it is, of course, necessary that we should all be in agreement on the terms to be used in aeronautics and on the meanings attached to those terms, at the same time I rather question the wisdom of promulgating a multitude of definitions without official sanction or of each individual's attaching his own meaning to the terms which he defines. That seems to be the straight road to nomenclature chaos, and it would be much better, if there are gaps in the officially accepted nomenclature, to wait until they can be filled in by the method already adopted as standard for modifying the system of terminology.

Although the terminological scheme proposed by the Messrs. Black agrees in general with what has become accepted practice, as expressed in the latest nomenclature report of the National Advisory Committee for Aeronautics, and most of their definitions for words not covered by the N.A.C.A. seem excellent, there is one definition to which I want to take strong exception. The term "airport" should, I am convinced, include both land and water stations, as the N.A.C.A. definition makes it do. The analogy between craft of the air and craft of the sea is very close, and it is altogether logical that the term "port" should be taken over directly from one to the other. We have reason to feel very strongly on this point here because the new landing field established at East Boston has been officially named the "Boston Airport" and that title has met with general approval both in military and in civilian quarters.

EDWARD P. WARNER
Boston, Mass.

AVIATION *fully shares Professor Warner's views with regard to the term "airport," which this magazine was one of the first to adopt and to use, and which has now received the official sanction of the National Advisory Committee for Aeronautics. The new term has the merit of being both brief and explicit, although the maritime analogy does not strictly apply, for a ship does not anchor in a seaport; it anchors in a harbor.—EDITOR.*

Navy Enters Schneider Cup Race

Three Navy flying boats have been entered into the European speed classic scheduled for next summer near the Isle of Wight in the competition for the Jacques Schneider aviation marine trophy. The entry was made Feb. 26 by the National Aeronautic Association on behalf of the Bureau of Aeronautics of the Navy Department. The rules require entry from clubs affiliated with the Fédération Aéronautique Internationale, which is solely represented in America by the National Aeronautic Association.

This is the first time the United States has entered the contest for the Schneider Cup, which has up to now been won twice by the Royal Aero Club of Great Britain and twice by the Aero Club of Italy. This contest is a test of speed and seaworthiness over a course measuring 200 nautical miles, the pilots having to land twice and taxi half a mile on the surface at a speed of twelve knots. This year three entries have been made by Graat Britain. France, Belgium and Italy will also compete.

American Entries, G. B. Race

Three American entries in the international balloon race for the James Gordon Bennett cup were made Feb. 28 by the National Aeronautic Association in behalf of the winners of the elimination race soon to be held in this country. The cup race will be held at Brussels, Belgium, Sept. 23, and is an international challenge contest for a trophy valued at 12,500 francs.

The national elimination race will be held on May 30. Detroit, Indianapolis, Milwaukee and San Angonio are competing for the meet, which will be conducted under direction of the Contest Committee of the National Aeronautic Association. Entries are allowed three contestants and three alternates, so that six balloons will probably go to Belgium for the cup contest.

Personal Paragraphs

Shirley Short, chief pilot and general manager of the airport at Monmouth, Ill., has received an appointment as pilot in the Air Mail Service. The particular section of the service to which he will be assigned has not yet been made public. Pilot Short went to Monmouth with the Curtiss-Iowa Aircraft Corp. Following the withdrawal of the company he was retained by a local firm as chief pilot and manager of the flying field, and it was mainly due to his untiring efforts that the Monmouth airport proved a success.

Harry Sadenwater, formerly Lieutenant, U. S. Navy, has been placed in charge of the technical operation of the broadcasting stations of the General Electric Company, including WGY at Schenectady, N. Y., and the projected station at San Francisco, Calif. Lieut. Sadenwater was radio officer on the NC1, commanded by Lt. Comdr. P. N. L. Bellinger, during the Navy's transatlantic flight expedition from Newfoundland to Portugal.

ARMY AND NAVY AIR NEWS

Air Service

The Army Airship RS1—The new Army airship RS1, now building at the Goodyear plant in Akron, Ohio, is a semi-rigid craft of the same type as was the Italian built "Roma," accidentally destroyed last year. It is, however, only similar in the general principle of its semi-rigid structure; that is, its keel of articulated steel sections is flexible. Unlike the keel of the "Roma," this keel is an inverted "V" in cross-section. The gas container is not supported nor strengthened by girders or braces within but, on the other hand, the keel is suspended and rests along the lower part of the envelope. The RS1 is about two-thirds the size of the "Roma," being of 665,000 cu. ft. capacity and 274 ft. in length, with a width of 73 ft., and a height of 69 ft. A crew of ten officers and men will be carried.

There are two power cars located about amidships equipped with two engines each, and a control car is situated forward, all cars being attached to the keel beneath the envelope. The craft is expected to develop a maximum speed of 70 m.p.h. The range of a single trip is figured as approximately 1630 miles, on a single charge of 2500 gal. of gas and 200 gal. of oil.

A study of the plans of the RS1 has been begun by the National Advisory Committee for Aeronautics at the request of Maj. Gen. Mason M. Patrick, Chief of Air Service, who is also a member of the National Advisory Committee. A special committee of structural engineers was appointed by Dr. J. S. Ames, to make a thorough study of the plans of the airship and check all stresses and strains before the ship is completed. This committee is composed of the same airship engineers and experts who have completed a study of the plans of the Navy's rigid airship ZR1, now being assembled at Lakehurst, N. J. They are:

Dr. Henry Goldmark, of New York, Chairman;
Prof. Wm. Hovgaard, of Boston;
Dr. L. B. Tuckerman, of the Bureau of Standards;
Dr. Max Munk, of the National Advisory Committee for Aeronautics;
W. Watters Pagon, of Baltimore, Secretary.

• • •

Identification of an Unknown Aviation Officer—After writing more than 300 letters to clothing stores all over the United States, the Graves Registration Service, of the Quartermaster Corps, has succeeded in identifying the body of an officer of the Air Service, who was killed with a brother Lieutenant while flying over the enemy's lines nearly five years ago.

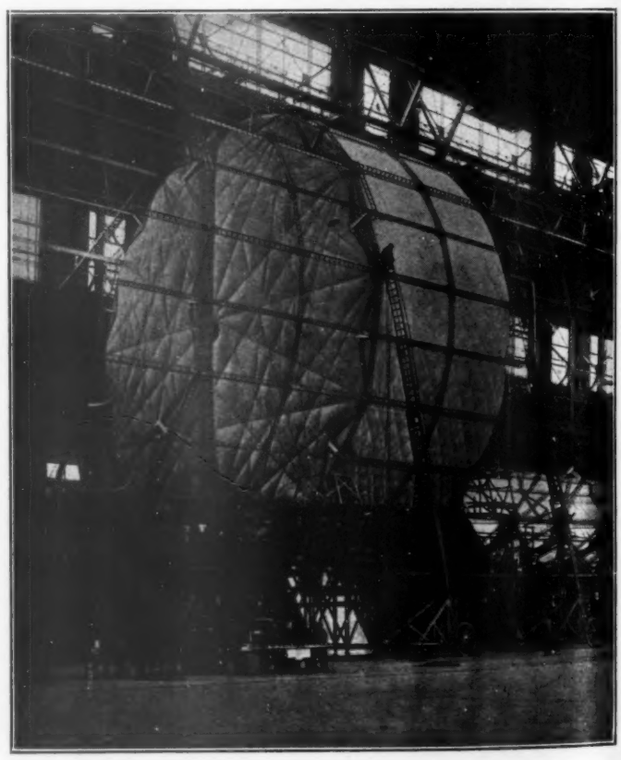
When burial parties were going over the ground in France they found the graves of Lieut. Dana E. Coates and an unknown officer near the railroad station at Letanne, northwest of Stenay, on the Meuse river. On the body of the unknown, who was evidently an officer, was found a laundry mark "L.R.T.", and a coat label bearing the name of a firm in Rochester, N. Y. This clothing company could give no facts as to the sale of the uniform, but furnished the names of more than 300 firms which sold their clothing, to all of whom letters were written. A store in Austin, Tex., replied that they had sold one of these uniforms on Feb. 9, 1918, to Lieut. L. R. Thrall, of the School of Military Aeronautics, at Austin. Search of the records of the First Air Depot, resulted in finding the fact that Lieutenant Thrall of the 11th Aero Squadron, had been buried by the enemy in France after he had been killed in company with Lieutenant Coates.

From these facts the body has been positively identified as that of Lieutenant Thrall and his relatives have been notified.

Lt. Col. Dwight F. Davis—Lt. Col. Dwight F. Davis, recently appointed Assistant Secretary of War, on Sept. 1, 1917, was commissioned as Captain, Company L, 5th Missouri Infantry, by the Governor of Missouri and reported for duty at the proclamation of the President. On Feb. 27, 1918, the Commanding General 35th Division, recommended his promotion as Major, National Guard, stating that if such recommendation was approved that he would be assigned as Assistant to Chief of Staff, of that Division, Section of Administration and Coordination. He was promoted on March 26, 1918, to Major National Guard, to rank from Feb. 27, 1918, which was accepted April 19, 1918. He was appointed Lieutenant Colonel of Infantry, Oct. 10, 1918, and served as Assistant Chief of Staff, G-3, 35th Division and Assistant Chief of Staff, G-3, 2nd Army, A.E.F. Graduate of General Staff College at Langres. He served overseas from April 25, 1918, to April 20, 1919. He was honorably discharged on April 29, 1919, his services being no longer required.

He was cited in General Orders No. 81, Headquarters, 35th Division, dated Oct. 11, 1918, and in Citation Orders No. 1, General Headquarters, June 3, 1919, "for carrying out the orders of his brigade commander in a manner utterly devoid of fear under the most intense artillery and machine gun fire. At Baulny, on Sept. 29 and 30, he recklessly exposed himself to the enemy fire in order to obtain information of great value to his brigade and division commanders," which citation carries the award of the silver star.

Lieut. Colonel Davis was born July 5, 1879, at St. Louis, Mo. Upon entry into service he gave his prior occupation as a Park Commissioner.



Official Photo U. S. Navy

First gas cell in place and under test in the naval airship ZR1 now being built at Lakehurst, N. J.

Air Service Activities Shown Through Movies—A series of short motion picture subjects showing the activities of the Air Service are now being released as part of the Pathé Review. This series has been in preparation at Mitchel Field for the past two months, and is appearing under the title of "The Cavalry of the Air."

Each subject treats of a different phase of the work at an Air Service station. The first of the series has been sub-titled "Contact," and is in both normal and slow motion photography. It shows the proper method of pulling the propeller through on a DH and the care and skill that must be exercised to avoid injury. The actual starting of the propeller is shown very graphically in slow motion photography, and it is possible to see the man's hand leave the blade of the propeller. Later it is projected making pictures of this same subject in maximum slow motion photography.

The second of the series will show a popular conception of the engineering features of an airplane, and the meaning of the various angles will be explained in a manner readily understandable to the lay mind. This subject will give the average citizen a general idea of the theory of flight. Incorporated in the subject are interesting items pertaining to construction, particularly as to the bridging used in the wings.

The third of the series will show the functioning of the Medical Research Laboratory at Mitchel Field and the rigid physical examination and tests aviators are subjected to before they are permitted to fly. In this subject views of the Orientator in actual use will appear.

As weather and other conditions permit, this series will be added to, and it is intended carrying it through the summer season during the training of the National Guard and the Officers' Reserve Corps.

* * *

Cross Country Flying from Brooks Field—For the purpose of giving all permanent officers of Brooks Field an opportunity of flying cross-country practice, in formation, in DH airplanes, each week a flight of five DH's will make a cross-country flight of at least one hundred miles, returning the same day. All permanent officers are required to make at least one cross-country flight per month. Captain Royce, Commanding Officer, led the first flight to Fort Clarke. The flight included 1st Lieuts C. C. Chauncey, Wendell B. McCoy, Arthur L. Thornton, Kenneth C. McGregor, Louis R. Merrick, John G. Williams, Clinton F. Woolsey, Kenneth Wolfe and Roderick Ott. The second flight was led by Captain Bock, and included 1st Lieuts. Hez McClellan, Pardoe Martin, Robert M. Webster, J. C. Taylor, F. I. Patrick, Stanley M. Umstead, E. D. Perrin, and 2nd Lieuts. D. W. Watkins and Robert Wimsatt.

* * *

Air Expedition to Porto Rico Started—The Porto Rican air expedition of the Air Service, consisting of six DH4B airplanes headed by Maj. Thomas G. Lamphier, A.S., started on its long trip March 3 by flying from Kelly Field, San Antonio, Tex., to Ellington Field, Houston, Tex., and from there to New Orleans.

On March 4 the six planes proceeded on their way from New Orleans to Maxwell Field, Montgomery, Ala. The ship of Lieuts. Charles Austin and Newton Longfellow developed engine trouble en route, but managed to make Maxwell Field. A new engine will be installed in this ship before the flight is resumed to Arcadia, Fla.

Maj. Gen. M. M. Patrick, Chief of Air Service, plans to leave Bolling Field, D.C., in a plane piloted by Captain Streett in time to meet the Porto Rican Air Expedition at Jacksonville and accompany it to Arcadia, Fla.

The last stop in the United States will be Carlstrom Field, Arcadia, Fla. From this point, a compass course will be taken following the general direction of the steamer route from Tampa, Fla., to Havana, Cuba, passing over the Florida Keys. After passing Key West, the flight is over open water until Havana is reached where the first landing outside of the United States will be made at the Air Port at Camp Columbia, seven miles west of the City. Inflated inner-tubes will be placed in the fuselages of the airplanes, in order to allow the planes to float in case they have forced landings on the water. An additional safety precaution is the wearing of Kapoc vests by the pilots which will allow them to float in case they are forced to land in the ocean and their airplanes sink. From Havana, the flight will proceed to Santa Clara, and after refilling with gasoline and oil will next land at Hicacal Beach, on Guantanamo Bay. This is the final landing on the Island of Cuba, and the most hazardous part of the route is still ahead of the flight. Following the shore of Cuba to Cape Maisi, the airplanes again must fly over forty miles of open water. Prevailing winds in this vicinity make this a most hazardous undertaking as the airplanes must not only buck a cross wind, but in case of a forced landing the high seas running through the Windward Channel would break up the airplanes in a few moments. Additional precautionary measures will be taken, therefore, to assure the safety of airplanes while flying over the Windward Passage, by stationing a sub-chaser midway in the passage during the flight. Following down the western shore of the Island of Haiti, the next landing will be made at the Marine Flying Station at Port-au-Prince. After a refilling of gasoline and oil at this point, a due east course will be set for Santo Domingo, Dominican Republic; the flight passing over very rugged and mountainous country in which landings are practically impossible. Leaving the Marine Flying Station at Santo Domingo, the next and final stop will be made in the vicinity of San Juan, Porto Rico, where the airplanes will be overhauled and relined and placed in condition for the trip back over the same route. The first landing in the United States will be at Miami, Fla., from which point the aviators will proceed to Jacksonville, Fla., thence to Fort Bragg, Fayetteville, N. C.; finally ending the flight at Bolling Field, Washington, D. C.

* * *

Army Orders—Sec. Lieut. Reuben Louis Wagner, A.S.O.R.C., Technical School, Chanute Field, promoted to First Lieutenant, A.S.O.R.C.

Maj. Theodore C. Macaulay, A.S.O.R.C., and Capt. Harry A. Erickson, A.S.O.R.C., relieved from active duty.

First. Lieut. Harold A. McGinnis, A.S., from 15th Obs. Sqd. Chanute Field to A.S. Technical School.

First Lieut. Owen E. Spruance, A.S., from A.S. Technical School to 15th Obs. Sqd. Chanute Field.

Maj. Frank M. Andrews, A.S., previously directed from A.E.F., Germany, to Langley Field, is redirected to office C.A.S.

First Lieut. Cortlandt S. Johnson, A.S., from Long Island Air Reserve Depot to temp. duty at Mitchel Field until departure about May 17,1923, for the Panama Canal Zone.

Coming Aeronautical Events

AMERICAN

May — *National Balloon Race.*
Oct. 1-3 — *National Airplane Races, St. Louis, Mo.*
Late Fall — *Curtiss Marine Flying Trophy Race.*

FOREIGN

1923

March 1 — *Entries close for Schneider Cup. Race.*
March 15 — *Entries close for Dutch Height Indicator Competition.*
March 23 — *Entries close for Gordon Bennett Balloon Race.*
June 25-30 — *International Aero Congress, London..*
July 20- — *International Aero Exhibition, Gothenburg,*
Aug. 12 *Sweden.*
Aug. 6-27 — *Sailplane Meet, Vauville, near Cherbourg, France.*
Sept. 23 — *Gordon Bennett Balloon Race, Brussels, Belgium.*
Dec. 1 — *Entries close for French Engine competition.*

Following A.S. officers to duty at Chanute Field with A.S. Technical School: Majors Frederick L. Martin, Follett Bradley; Captains William D. Wheeler, Ernest Clark; First Lieutenants Edwin B. Bobzien, Howard C. Brandt, George H. Brown, Bernard T. Castor, John J. Devery, jr., Louis N. Eller, James Flannery, John H. Gardner, James D. Givens, Arthur G. Hamilton, James W. Hammond, Lawrence P. Hickey, James P. Hodges, Henry W. Kunkel, Floyd A. Lundell, Jasper K. McDuffie, Joseph T. Morris, Frank M. Paul, Oliver K. Robbins, John W. Shoptaw, Stanley Smith, Owen E. Spruance, Henry E. Wooldridge; Sec. Lieut. Haynie McCormick.

To Chanute Field with 15th Sqd. (Obs.): First Lieut. Harold H. Carr, First Lieut. Lionel H. Dunlap, Sec. Lieut. Clarence H. Schabacker, A.S.

Maj. Follett Bradley, A.S., to be Assistant Commandant, A.S. Technical School, Chanute Field.

Relieved from training at Primary Flying School, assigned to duty at Brooks Field: First Lieut. Orin J. Bushey, A.S., Sec. Lieut. Kenneth F. Pughe, A.S.

First Lieut. Raymond S. Jett, A.S., from Kelly Field to Post Field.

Lt. Col. Arthur G. Fischer, A.S. relieved from training at Primary Flying School, to Brooks Field for duty, and to Lakehurst naval Air Station for course in instruction in rigid airship training.

Naval Aviation

Navy Search for Missing Seaplane—The Navy dispatched March 1 three seaplanes to aid in the search for a private seaplane which was lost between Florida and the Bahamas Friday, Feb. 23. Although the plane was reported as missing in dispatches from Stuart, Fla., on Feb. 27, and vessels were asked to aid in the search, it is understood that the Pensacola Naval Air Station was not asked to assist until Feb. 28. The lost plane left Stuart on Feb. 23 for Bimini and started to return the same afternoon. On board were Delos Thomas of Roanoke, Va., and Capt. Theodore Tibbs, press reports stated.

Lieuts. C. K. Wildman, S. E. Haddon, and C. M. Cogauley were ordered to take part in the search. They were attached to the Torpedo and Bombing Planes Squadron No. 1, at Pensacola, Fla. The three pilots returned to Pensacola naval air station on March 2 after an unsuccessful search.

* * *

Naval Air Force Gunnery Practice Planned—The Air Force of the Navy will take part in the regular gunnery exercises commencing July 1 this year. Rules and regulations are now being formulated for the gunnery exercises on a competitive basis for the fleet of the air as well as the fleet of the sea. For the first time aircraft of the fleet will be placed on the same basis as the battleships and destroyers. Details are not available but it is intended that the annual aircraft practices shall include gunfire, bombing and torpedo attacks such as would be undertaken in time of war. Competition will be arranged between squadrons of the same type of craft, and the personnel making the highest scores will be awarded the Naval "E" for excellence, which is worn on the arm.

Possibly the successful planes will also rate an "E" to be emblazoned on some part of its fuselage, just as is shown on the funnels or turrets of the excellent battleships, but this is not recommended yet.

* * *

Naval Orders—Lieut. John E. Ostrander, det. Nav. Aca., Annapolis, Md.; to Bu. Aer., Washington, D. C.

Ens. Edgar W. Sheppard, det. Bu. Aer.; to Nav. Air Sta. Lakehurst, N. J.

Lieut. Harry A. Miller (S.C.) and Lieut. j.g. Henry H. Karp (S.C.) det. Supply Corps School of Application, Navy Dept.; to Nav. Aire. Fact. Philadelphia, Pa.

Lieut. Hugh O. Quinn (S.C.), det. Nav. Air Sta. Cape May, N. J.; to O. in C. Commissary Store, Navy Yd., Philadelphia, Pa.

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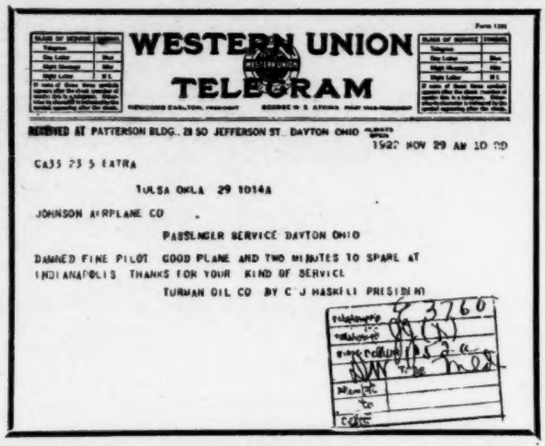

WESTERN UNION TELEGRAM

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Flottorp	Birch	Toothpick	8'4"	5'	20.00
Liquid Carbonic	Birch	Toothpick	8'4"	5'	15.00
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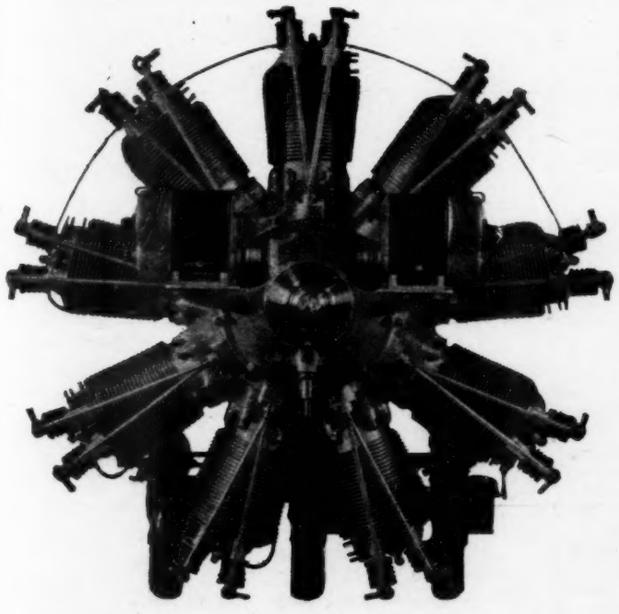

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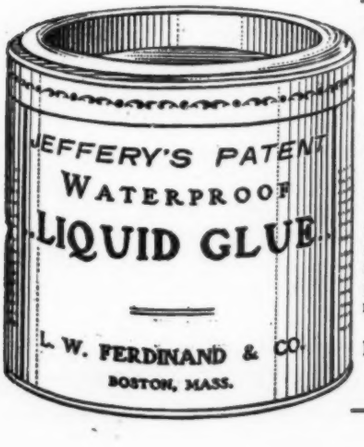

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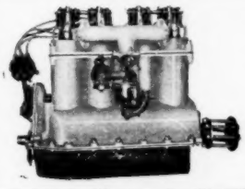

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